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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/688,047	10/17/2003	Chung Foong Tan	CS03-021	9186

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GEORGE O. SAILE  
28 DAVIS AVENUE  
POUGHKEEPSIE, NY 12603

EXAMINER

GUERRERO, MARIA F

ART UNIT PAPER NUMBER

2822

DATE MAILED: 04/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/688,047	<b>Applicant(s)</b> TAN ET AL.	
	<b>Examiner</b> Maria Guerrero	<b>Art Unit</b> 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 March 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 20-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

1. This Office Action is in response to the Election filed March 9, 2005.

**Status of Claims**

2. Claims 1-25 are pending.

***Election/Restrictions***

3. Applicant's election with traverse of Group I, claim 1-19 in the reply filed on March 9, 2005 is acknowledged. The traversal is on the ground(s) that the fields of search for the group I and group II inventions are co-extensive. This is not found persuasive because the product and the process of manufacturing semiconductor devices are recognized in the office as being independent and having a separate status in the art. The Examiner's suggestion that the product can be made by "growing an intrinsic silicon and implanting carbon to form the carbon-dope layer" is just an example to show that the inventions are distinct because the product as claimed can be made by another and materially different process.

The requirement is still deemed proper and is therefore made FINAL.

4. Claims 20-25 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on March 9, 2005.

***Information Disclosure Statement***

5. The information disclosure statement (IDS) submitted on January 29, 2004 has been considered.

***Specification***

6. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

***Claim Objections***

7. Claims 4, 10, and 17 are objected to because of the following informalities: the claims recited " a carbon content of up to 0.5%; the claims do not describe if is atomic percent or weight percent. Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Puchner (US 6,358,806).

Puchner shows providing a bulk silicon substrate (12), depositing a carbon-doped silicon layer (20) on the bulk silicon substrate (12), and growing an epitaxial silicon layer (21) overlying the carbon-doped silicon layer (20) to provide a starting wafer for integrated circuit fabrication (col. 4, lines 1-20).

9. Claims 1 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Babcock et al. (US 2002/0033511).

10. Babcock et al. shows providing a bulk silicon substrate (10), depositing a carbon-doped silicon layer (160) on the bulk silicon substrate (10), and growing an epitaxial silicon layer (170) overlying the carbon-doped silicon layer (160) to provide a starting wafer for integrated circuit fabrication (Fig. 3a-4b, paragraphs 0016-0017). Babcock et al. teaches forming a gate electrode on the starting wafer (Fig. 3b-4b). Babcock et al. discloses implanting LDD and source/drain regions in the starting wafer adjacent to the gate electrode (Fig. 3b-4b, paragraphs 0016-0017).

11. Furthermore, Babcock et al. describes implanting a heavy ion to form halo implants adjacent to the LDD regions and underlying the gate electrode (Fig. 4a-4b, paragraph 0017). Babcock et al. shows the halo implants extending to an interface between the epitaxial silicon layer and the carbon-doped silicon layer (Fig. 4a-4b, paragraph 0017).

12. Claims 1-4 are rejected under 35 U.S.C. 102(e) as being anticipated by Yeo et al. (US 6,492,216).

13. Yeo et al. shows providing a bulk silicon substrate (1), depositing a carbon-doped silicon layer (2) having a carbon content of between about 0 to 4% on the bulk silicon substrate (1), and growing an epitaxial silicon layer (3a) overlying the carbon-doped silicon layer (2) to provide a starting wafer for integrated circuit fabrication (Fig. 1-2, col. 3, lines 32-45, col. 4, lines 3-10). Yeo et al. discloses depositing a carbon-doped silicon layer (2) by a reduced pressure chemical vapor deposition and having a thickness between about 20 to 500 Angstroms (col. 3, lines 31-40).

14. Claims 1, 3, 5-7, 9, 11-14, 16, and 18-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Mansori et al. (US 6,830,980).

15. Mansori et al. shows providing a bulk silicon substrate (12), depositing a carbon-doped silicon layer (20) by chemical vapor deposition on the bulk silicon substrate (12), and growing an epitaxial silicon layer (21) overlying the carbon-doped silicon layer (20) to provide a starting wafer for integrated circuit fabrication (Fig. 1-3, col. 5, lines 3-30). Mansori et al. teaches forming a gate electrode on the starting wafer (col. 8, lines 18-25). Mansori et al. discloses implanting LDD and source/drain regions in the starting wafer adjacent to the gate electrode (col. 8, lines 18-36).

16. Furthermore, Mansori et al. describes implanting a heavy ion (indium or antimony) to form halo implants adjacent to the LDD regions and underlying the gate

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electrode (Fig. 16-17, col. 1, lines 28-40, col. 8, lines 25-40). Mansori et al. shows the halo implants extending to an interface between the epitaxial silicon layer and the carbon-doped silicon layer (Figs. 15-17, col. 8, lines 25-40). Mansori et al. teaches the carbon-doped silicon layer having a thickness about 10-1000 Angstroms, for example about 100-500 Angstroms (col. 5, lines 2-30). Mansori et al. shows the epitaxial silicon layer having a thickness about 400-500 Angstroms (col. 5, lines 29-32).

17. Mansori et al. teaches the carbon-containing region being formed to inhibit diffusion of dopants during fabrication (Abstract, col. 2, lines 19-60, col. 4, lines 25-47). Therefore, the purposed of prevent end of range secondary defect formation is inherently disclosed by Mansori et al.

18. In addition, the elements must be arranged as required by the claim, but this is not an *ipse dixit* test, i.e., identity of terminology is not required. In *re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

19. Furthermore, there is no requirement that a person of ordinary skill in the art would have recognized the inherent disclosure at the time of invention, but only that the subject matter is in fact inherent in the prior art reference. *Schering Corp. v. Geneva Pharm. Inc.*, 339 F.3d 1373, 1377, 67 USPQ2d 1664, 1668 (Fed. Cir. 2003). See also *Toro Co. v. Deere & Co.*, 355 F.3d 1313, 1320, 69 USPQ2d 1584, 1590 (Fed. Cir. 2004).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

20. Claims 2, 8, 10, 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mansori et al. (US 6,830,980) in view of Takahashi (U.S. 6,743,704).

Mansori et al. describes the carbon concentration of about 0.1 atomic percent or more (col. 5, lines 10-15).

Mansori et al does not specifically show the carbon content of up to 0.5% as claimed. Mansori et al does not specifically describe the chemical vapor deposition being at reduce pressure. However, Takahashi shows depositing a carbon-doped silicon layer by reduce pressure chemical vapor deposition and having a carbon content of up to 0.5% (col. 6, lines 8-15, 30-37).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Mansori et al. reference by specifying the carbon content of up to 0.5% and the chemical vapor deposition being at reduce pressure as taught by Takahashi because Mansori et al. suggested that the carbon concentration could be more than 0.1 atomic percent (col. 5, lines 10-15). There is not evidence of criticality; therefore, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA



1955). In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). See MPEP § 716.02 - § 716.02(g).

### ***Conclusion***

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Drobny et al. (US 6,576,535) shows the step of depositing a carbon-doped layer on a bulk silicon substrate as conventional in the art.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

April 12, 2005

*Maria Guerrero*  
**MARIA F. GUERRERO**  
**PRIMARY EXAMINER**